BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 07

2003 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

July 2003

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South Carolina Department of Health and Environmental Control

WEB ADDRESS:
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2003 ANNUAL UPDATE

[Data Thru December 2002]

Shellfish Management Area 07
Shellfish Sanitation Program

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ANNUAL UPDATE
Shellfish Management Area 07
SCDHEC EQC Bureau of Water

Data Inclusive Dates:
01 / 01 /00 thru 12 / 31 / 02

Classification Change:
___Yes __X__No

Shoreline Survey Completed: Yes

(I)ncreased/(D)ecreased/(N)one:
__N__ Approved
__N__ Cond. Approved
__N__ Restricted
__N__ Prohibited

Prior Report & Date: Annual -2002

SUMMARY

Over the past several years, the majority of shellfish water quality stations within Area 07 have indicated relative stability in terms of fecal coliform levels. Individual sewage treatment and disposal systems are used exclusively in the Area 07 Management Area. Nearly all of Area 07 lies within the confines of the Cape Romain National Wildlife Refuge and the vast wildlife and waterfowl populations supported by this area likely contribute to growing area fecal coliform concentrations. An additional management factor is freshwater inflow due to the Santee Rediversion Project. The Santee River typically sends substantial amounts of fresh water into the growing area. During high flow periods, low salinity water enters the northern portion of Area 07 through Area 06B, via the AIWW. There appears to be a positive correlation between high river flow, low salinities, and elevated fecal coliform concentrations. Statistically, indicator data from all Area 7 shellfish water quality stations during the current three-year review period exhibited a slight downturn in bacteriological water quality from data collected during previous three-year period. During 2000, Santee-Cooper released an average daily flow rate 4% less than that of the previous year. During 2001, the average daily flow rate was reduced by an additional 28%, however 2002 average daily flows increased 92% above 2001 levels.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47 which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved, Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S. C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform MPN shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP Guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, nonpoint source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data shows a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted

only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, nonpoint source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution), and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

This sanitary survey evaluates the current harvesting classification of shellfish growing waters designated as Shellfish Management Area 07 (Area 07). Area 07 consists of approximately 40,375 acres of shellfish growing area habitat located in Charleston County, South Carolina. Area 07 extends from just north of the village of McClellanville eleven miles southwestward to the southern end of Bulls

Bay, and . It consists of the waters of Bulls Bay, the Atlantic Intracoastal Waterway (AIWW), Muddy Bay, Romain River and Awendaw, Five Fathom, Graham, Horsehead, Jeremy, Tibwin and Venning Creeks. The northern boundary of the area extends from the AIWW Marker #32 southeastward to Cape Island and the southern edge of Cape Romain Harbor. US Highway 17 defines the western border of the management area. The area is bounded to the south by an imaginary line extending between AIWW Marker #68 and the northeastern tip of Bull Island. The eastern boundary parallels the mouth of Bulls Bay, from Bull Island to Raccoon Key, then follows an easterly direction on the Atlantic side of Raccoon Key to Cape Romain.

The harvesting classification of Area 07 prior to this sanitary survey was as follows:*

Prohibited: (Administrative closure)

Jeremy Creek, extending from its headwaters to 315 feet into the AIWW, and extending 714 feet in each direction along the AIWW, from the shrimp dock at the mouth of Jeremy.

Restricted:

1. The AIWW, from the northern boundary of Area 07, extending southwest to Station 18 at Venning Creek;
2. All of Awendaw, Clubhouse, Doe Hall, Graham, Mathews, Sandy Point, Tibwin and Town Creeks;
3. Five Fathom Creek, approximately 2000 feet seaward of Station 6, northward to the AIWW;
4. Graham Creek, including portions of Bulls Bay within 1000 feet of Station 2A.

Approved: All other waters in Area 07.

The shellfish industry in South Carolina is based primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). Areas in South Carolina designated for commercial harvest by the South Carolina Department of Natural Resources (SCDNR) include State shellfish grounds, culture permits, and Kings Grant areas. The ribbed mussel (*Geukensia demissa*) is also harvested in South Carolina. It is primarily gathered on a small scale by the general public for recreational harvest. The South Carolina Department of Health and Environmental Control will disallow the harvesting of shellfish within Area 07, for direct marketing purposes, from the restricted waters listed below in the Recommendations.

There are four State shellfish grounds within Area 07. S-280 lies within the AIWW and is restricted in it's entirety. State ground 275 is approved southward from its border with S-280. S-279 and S-286 are both classified as approved. One recreational shellfish ground, R-292, is located in Long Creek and is currently classified as approved. There are multiple culture permit areas throughout the Area 7.

The shellfish harvest season in South Carolina normally extends from mid-September through mid-May. The SCDNR has the authority to alter the shellfish harvest season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

CHANGES IN POLLUTION SOURCES

One Area 07 pollution source has recently become more dynamic. In 2000, Santee-Cooper released water with an average daily flow rate of 3,548 cubic feet per second (cfs). In 2001, the water released had an average daily flow of 2,547 cfs. This represents a 28% reduction from 2000 average daily flows. In 2002, the average daily flow rate was 4,900 cfs. This represents a 38% increase from 2000 average daily flows, and a 92% increase from 2001 average daily flows.

SURVEY PROCEDURES

Shoreline surveys of Area 07 were conducted by the Trident District Shellfish Sanitation staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examinations of lands adjacent to the waters of Area 07 were conducted to determine potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

A. **Municipal and Community Waste Treatment Facilities** - The sole domestic wastewater treatment facility within close proximity to waters suitable for the direct harvest or relaying of shellfish is the Lincoln High School facility. This facility discharges its treated effluent into Shingle Canal that ultimately discharges to the administratively Prohibited waters of Jeremy Creek. The facility consists of a lagoon with an aerator which discharges to a chlorine contact chamber and then to a pond prior to discharge into Shingle Canal. This National Pollutant Discharge Elimination System (NPDES) site is currently operating under permit number SC0033618. The McClellanville Middle School currently utilizes a pump and haul method for off site wastewater disposal.

B. **Industrial Waste (Discharges)** - There are no direct industrial wastewater discharges located within the boundary of Area 07.

Santee Cooper's Spillway Hydro at Wilson's Landing, along with the St. Stephens Hydro near St. Stephens, produce power and regulate freshwater flow into the Santee River system. In order to prevent flooding during periods of high flow into Lake Marion, freshwater is discharged from the Lake Marion Spillway to the Santee River. The vast amounts of fresh water released into the Santee River during these high flow periods probably impact the water quality within

portions of Area 07. Refer to Table 5 of total water released by Santee Cooper.

C. **Marinas** - S.C. Regulation 61-47, Shellfish defines *Marina* as "any water area with a structure (docks, basin, floating docks, etc.) which is: 1) used for docking or otherwise mooring vessels; and, 2) constructed to provide temporary or permanent docking space for more than ten boats, or has more than 200 linear feet of docking space." Extensive commercial boat docking facilities are located in Jeremy Creek which is administratively Prohibited in it's entirety. These facilities provide approximately 4000 feet of moorage for commercial fishing vessels. Additionally, a Prohibited closure zone established based upon a theoretical dilution analysis, extends into the AIWW 714 feet upstream and downstream from Jeremy Creek's northeast point. There are no sewage pumpout facilities within Jeremy Creek.

D. **Radionuclides** - Sources of radionuclides have not been identified within Area 07, and radionuclide monitoring has not been conducted. No other sources of poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

A. **Urban and Suburban Stormwater Runoff** - The shoreline survey conducted in Area 07 revealed highly populated areas along the shores of Awendaw and Jeremy Creeks, which present the potential for bacteriological impacts resulting from rainfall events. The headwaters of Awendaw, Jeremy and Tibwin Creeks originate in the freshwater swamps of the Francis Marion National Forest, approximately four miles from their confluences with the AIWW. These creeks serve as direct conduits for low salinity water associated with rainfall and stormwater runoff. Additionally, Jeremy Creek is impacted by runoff from a series of large storm drainage ditches that serve the village of McClellanville.

Ongoing field observations have revealed that along Awendaw Creek there were five horses in a pasture that had a small ditch that lead from the field to the creek on the east side of US Highway 17-North. It was also noted that eight horses were in two different pastures along Awendaw Creek on the west side of US Highway 17-North. There appears to be approximately 18 homes near the waters edge of Awendaw Creek. Sandy Point Creek has some homes at its headwaters. It also has two large ponds that harbor vast amounts of waterfowl. There are no homes along Doe Hall Creek; however, it does have three ponds that feed this creek. A large bird population can be seen at all three ponds. A drainage canal can be seen leaving US Highway 17-North and entering Doe Hall Creek. A large land clearing and logging operation occurred in 2001 along the shores of the creek also. Tibwin Creek has three ponds that may influence its water quality. The first two ponds are at the headwaters of the third creek on the west side of Tibwin Creek, upstream from the AIWW. The third pond is on the west side of Tibwin Creek at its headwaters near US Highway 17. There is a small drainage canal that has been dug from the extreme headwaters of Tibwin Creek that leads under US Highway and extends through a small community that is along SR-335 and SR-2206. This community has approximately 18 residences and a large part of the community is associated with farming. Five of the residences were noted to have small numbers of farm animals; to

include cows, goats and horses. There is an extensive ditch system along these tracts of land that drains to Tibwin Creek.

There are currently two stormwater permits that have been issued within Area 07; the first is located directly southwest of McClellanville, adjacent to the AIWW and north of Mathews Creek. This permit was issued to the Army Corps of Engineers in association with a past dredging project. The second project is adjacent to the AIWW and nearly equal distance between Graham and Venning Creeks. This permit is being used in conjunction with on going construction in the Doar Road area. The Army Corps of Engineers did not conduct any dredging projects during 2002 in Area 07. Stormwater runoff impacts water quality by transporting fecal coliform bacteria from land to the shellfish growing area.

The uplands surrounding the shellfish growing waters of Area 07 consist of various soil textures. These have been defined by the United States Department of Agriculture (USDA), Soil Conservation Service (1971) utilizing general classifications and descriptions. Although lands within Area 07 consist of numerous soil types, the area is generally comprised of Seewee-Rutlege soils, nearly level and gently sloping woodland and cropland loamy fine sand. The USDA (1971) further describes these soils as "somewhat poorly drained to moderately well drained, nearly level, sandy soils on ridges and poorly drained to very poorly drained, sandy soils in depressions."

B. **Agricultural Runoff** - There are no permitted agricultural facilities located in Area 07. Although, there are horse farms located within the area. Two horse farms are located on the west side of Doar Road, west-southwest of Graham Creek. Another horse farm is located on the east side of US Highway 17, south of the intersection of Seewee Road and Doar Road near US Highway 17. These farms are within 1500 feet of a tributary that flows to the AIWW.

C. **Individual Sewage Treatment and Disposal Systems** - New homes continue to be built along the AIWW from Moore's Landing to Jeremy Creek. There are also several lots being cleared in this area. All homes within this area utilize individual sewage treatment disposal (ISTD) systems. Each system is required to be inspected by the Division of Environmental Health, Trident Health District, and approved before final installation.

D. **Wildlife and Domestic Animals** - Area 07 supports substantial populations of both wildlife and domestic animals. The lands throughout the area help comprise the Cape Romain National Wildlife Refuge. The refuge contains such wildlife as beaver, rabbit, white-tailed deer, raccoon, opossum, alligators, various rodents, and a substantial bird population typical of coastal South Carolina. The tidal uplands in the refuge have small creeks and drainage ditches throughout the area. This creek system becomes a conduit for animal fecal coliform bacteria to be transported to the adjacent shellfish growing waters.

Doe Hall, Sandy Point and Tibwin Creeks have ponds that are frequented by waterfowl. The ponds incorporate spillways that overflow at times of heavy rains in order to maintain a consistent pond levels.

E. **Boat Traffic** - Recreational boat traffic is relatively sparse throughout the area during the winter months. Shrimp baiting season, which typically begins in September and ends in November, contributes to moderate levels of recreational boat traffic throughout the area. Commercial traffic in the AIWW consists primarily of tugs and barges. Commercial fisheries boats, ranging in size from 16 to over 50 feet, operate at frequencies consistent with product demand.

F. **Hydrographic and Habitat Modification** - Hydrographic and habitat modification in estuarine areas requires both State and Federal approval. Portions of the AIWW require periodic maintenance dredging. The U.S. Army Corps of Engineers utilizes designated tracts of land adjacent to the AIWW as dredge spoil sites.

G. **Marine Biotoxins** - Bivalve shellfish contamination from marine biotoxins has not been shown to be a human health concern within Area 07. The Department participates in a State Task Force on Toxic Algae and maintains a toxic algae emergency response team.

HYDROGRAPHIC AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Shellfish Management Area 07 is comprised of salt and brackish marsh and includes shallow bays and meandering creeks protected by a series of offshore barrier islands. The entire system is approximately four miles wide (northwest to southeast) and eight miles long (southwest to northeast). The creeks within the area range from 15 to 700 feet in width and average 3 to 18 feet in depth. Additionally, the AIWW traverses the area's entire length in a northeast-southwest direction. The AIWW is maintained at a depth of 12 feet by the US Army Corps of Engineers. The AIWW is a major conduit of low salinity water into Area 07 from the South Santee River. The major upland creeks also provide an influx of fresh water via drainage from the Francis Marion National Forest. Bulls Bay and Five Fathom Creek are the major conduits of high salinity ocean water into the area.

Tides - Tides in Area 07 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges in the AIWW at Buck Hall are 5.0 feet during normal tides and 6.6 feet during spring tides. Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

Rainfall - Precipitation in Area 07 is typically heaviest during late summer and early autumn. Tropical storms and hurricanes occasionally produce extremely large amounts of rainfall. During winter months heavy rainfall events are uncommon, yet occasional intense thunderstorms associated with rapidly moving low-pressure systems generate heavy rains. Precipitation occasionally occurs in the form of snow or ice. Spring and summer weather patterns are often dynamic with associated thunderstorms and severe weather conditions.

The yearly rainfall average for the thirty-year period 1973-2002 for Charleston, recorded at the

Charleston Airport, is 50.74 inches. The 2002 precipitation total recorded in McClellanville, approximately 35 miles northeast of Charleston, was 62.06 inches, with July through October accounting for 28.91 inches or 47% of the yearly total.

Winds - Prevailing winds along the central portion of the South Carolina coast are from the south and west during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occur occasionally.

River Discharges -Freshwater inflow from the Santee River in Area 06B has indirect impact upon the portions of Area 07, primarily the AIWW. The freshwater marshes of Francis Marion Swamp also drain into several tidal creeks that enter the AIWW.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 07 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

During July 1998, an updated shellfish water quality data scheduling and collection procedure was formalized. Samples utilized for classification purposes are limited to those samples collected in accordance with the SRS for a 36-month period beginning January 1 and ending December 31. This allows for a maximum of 36 samples per station, yet provides a six-sample “cushion” (above the NSSP required 30 minimum) for broken sample bottles, lab error, breakdowns, etc. This also allows each annual report’s water quality data to meet the requirements for the NSSP Triennial Review sampling criteria.

Eight hundred and four SRS surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from twenty-three active water quality sampling stations in Area 07 during the period 01/01/00 through 12/31/02. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported to the South Carolina Department of Health and Environmental Control's Trident District Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. At the laboratory, sample sets exceeding a 30-hour holding time or containing a temperature control in excess of 10 degrees C. were discarded (APHA, 1970).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated

centigrade thermometers. Salinity measurements were measured in the laboratory using an automatic temperature compensated refractometer. Additional field data include ambient air temperature, wind direction, tidal stage, and date and time of sampling. Tidal stages were determined by using Nautical Software's *Tides & Currents*, Version 2 (1996).

MONITORING RESULTS

Stations 3 and 15 exceeded a fecal coliform geometric mean MPN/100 ml. value of 14. No station exceeded a fecal coliform geometric mean MPN/100 ml. value of 88. Stations exceeding a fecal coliform MPN/100 ml. estimated 90th percentile value of 43 were 2, 2A, 3, 5, 14, 15, and 19. Station 15 exceeded an estimated 90th percentile fecal coliform MPN/100 ml. value of 260.

Station 20 is new and has less than the required 30 routine samples necessary for classification. Station 20 was added in 2001 in response to a request from USFDA to more accurately delineate the classification boundary at Bulls Bay and Graham Creek. A Fecal Coliform Bacteriological Data Summary Table is included in this report (see Table 2). Fecal coliform bacteriological raw data collected between 01/01/99 and 12/31/02 are included following the data summary table.

CONCLUSIONS

Based on the review of fecal coliform bacteriological data and the pollution source survey, Area 07 appears to be impacted by two sources of actual or potential pollution.

NONPOINT SOURCE RUNOFF

Stormwater runoff appears to be a major source of fecal coliform bacteria contamination in the area. The majority of Area 07 lies within the boundary of the Cape Romain Wildlife Refuge. The upland, small tidal islands and the vast network of creeks are teaming with wildlife. The dredge spoil areas used by the Army Corps of Engineers and the multiple ponds noted along Doe Hall, Sandy Point and Tibwin Creeks provide prime habitat for regional wildlife and migratory waterfowl.

FRESHWATER INFLOW

Area 07 receives freshwater from the South Santee River via the AIWW and from creeks that extend into the Francis Marion National Forest. The flow of water from the Santee Rivers into the area is supplemented by water released by Santee-Cooper as part of the rediversion project. The greatest amount of water is typically released between the months of December and May. Analytical results have suggested a direct relationship between lower salinity and elevated fecal coliform bacteria concentrations.

RECOMMENDATIONS

The shoreline survey and the bacteriological data review of shellfish growing Area 07 indicate that the current classification boundary descriptions are appropriate:

Prohibited: (Administrative closure)

Jeremy Creek, extending from its headwaters to 315 feet into the AIWW, and extending 714 feet in each direction along the AIWW, from the shrimp dock at the mouth of Jeremy.

Restricted:

1. The AIWW, from the northern boundary of Area 07, extending southwest to Station 18 at Venning Creek;
2. All of Awendaw, Clubhouse, Doe Hall, Graham, Mathews, Sandy Point, Tibwin and Town Creeks;
3. Five Fathom Creek, approximately 2000 feet seaward of Station 6, northward to the AIWW;
4. Graham Creek, including portions of Bulls Bay within 1000 feet of Station 2A (including Station 20).

Approved: All other waters in Area 07.

Station Additions/Deactivations/Modifications: None

Analysis of sampling data for Area 07 demonstrates the probability of a significant impact from rainfall exceeding 4.00" in a 24 hour period. Therefore, a precautionary closure of Area 07 will be implemented following rainfall events of greater than 4.00" in a 24 hour period, as measured at the Wambaw Ranger District, Francis Marion National Forest, McClellanville. This methodology is associated with the concept of the Probable Maximum Precipitation (PMP). PMP estimates for the coastal United States has been published in a series of hydro-meteorological reports (HMRs) by the National Weather Service (*National Weather Service*). PMP estimates for South Carolina's growing areas are derived from HMRs 51, 52, and 53 (*National Research Council, 1985*).

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TABLE #1
Shellfish Management Area 07
Water Quality Sampling Stations Description

Station	Description
01	Venning Creek - adjacent to Marker #67
01A	Venning Creek at Bulls Bay
02	Graham Creek at Marker #64
02A	Graham Creek and Bulls Bay
03	Awendaw Creek at Marker #57
04	Harbor River at Marker #48
04A	Harbor River at Bulls Bay
05	Tibwin Creek at Marker #42
06	Five Fathom Creek at Marker #20
06A	Five Fathom Creek at Bull River
08	Clubhouse Creek-1/4 mile north of Five Fathom Creek
08A	Oyster Bay at Muddy Bay
09	Confluence of Doehall Creek with AIWW - north of Marker #46
11	Five Fathom Creek at Marker #11
12	Confluence of Raccoon Creek and Romain River
13	Romain River at confluence of ? S? Creek
14	Doehall Creek-third bend
15	Sandy Point Creek - 4th bend
16	Confluence of Romain River and Santee Path Creek
17	Second small Cr. N. of Marker #18 in Five Fathom Creek
18	Marker #65 in AIWW
19	AIWW at confluence with unnamed creek, 1.5 miles southwest of Graham Creek (landward side of waterway).
20	Bulls Bay - 1,000 feet from its confluence with Graham Creek (NEW)

(Total 23)

Figure 1.

Shellfish Management Area 07
Prior Classification

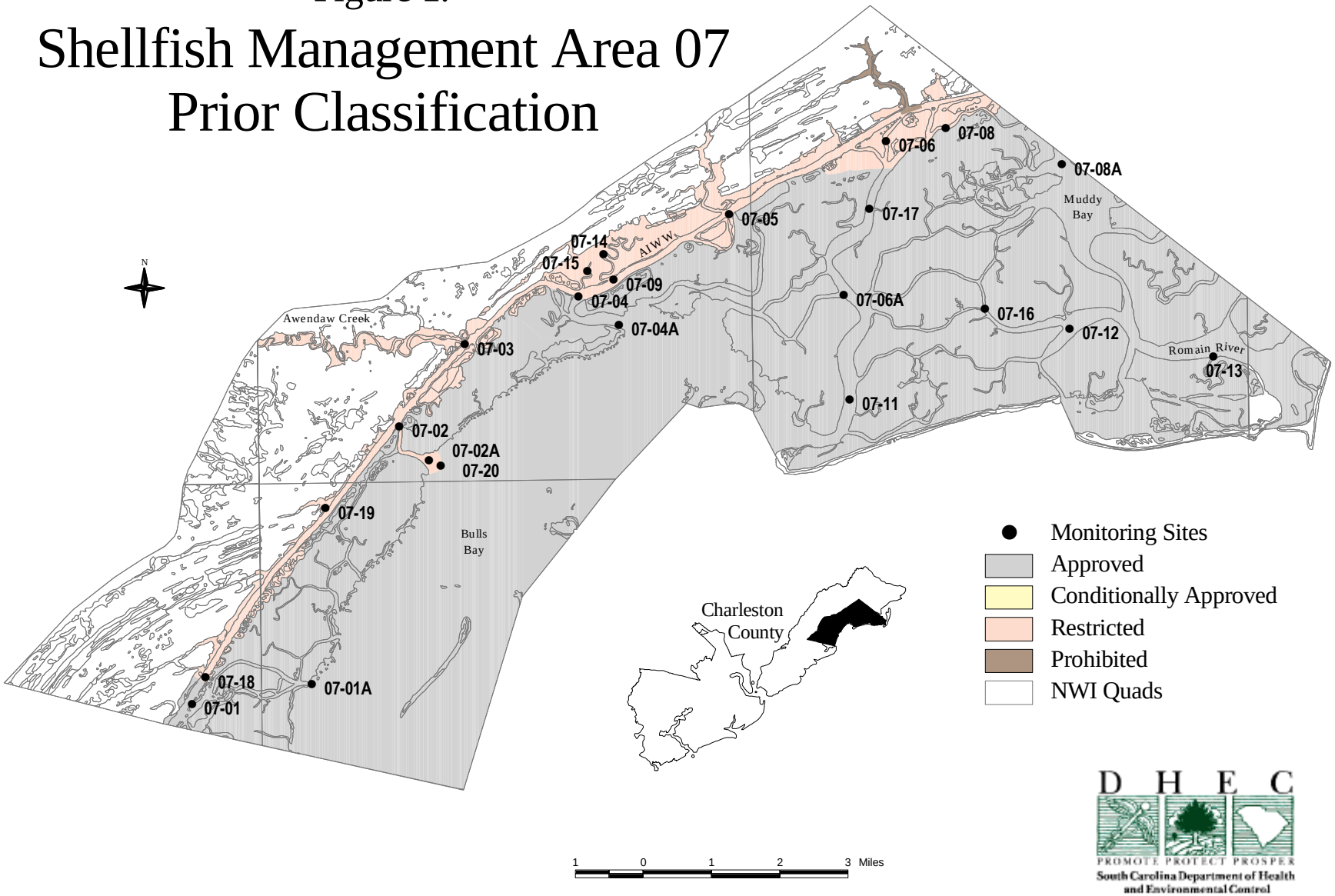

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Figure 2.

Shellfish Management Area 07
Current Classification

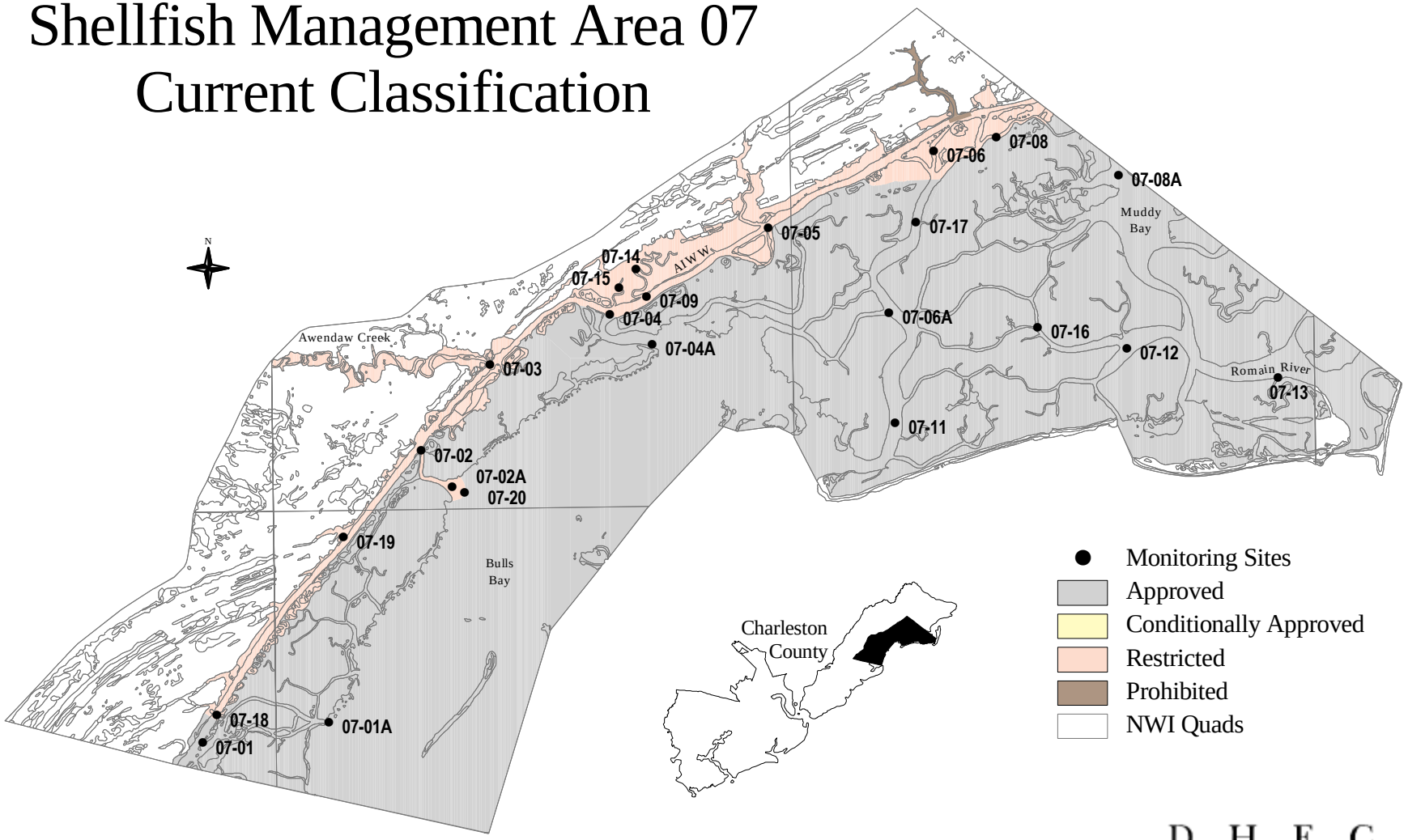

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Figure 3.

Shellfish Management Area 07

Potential Pollution Sources

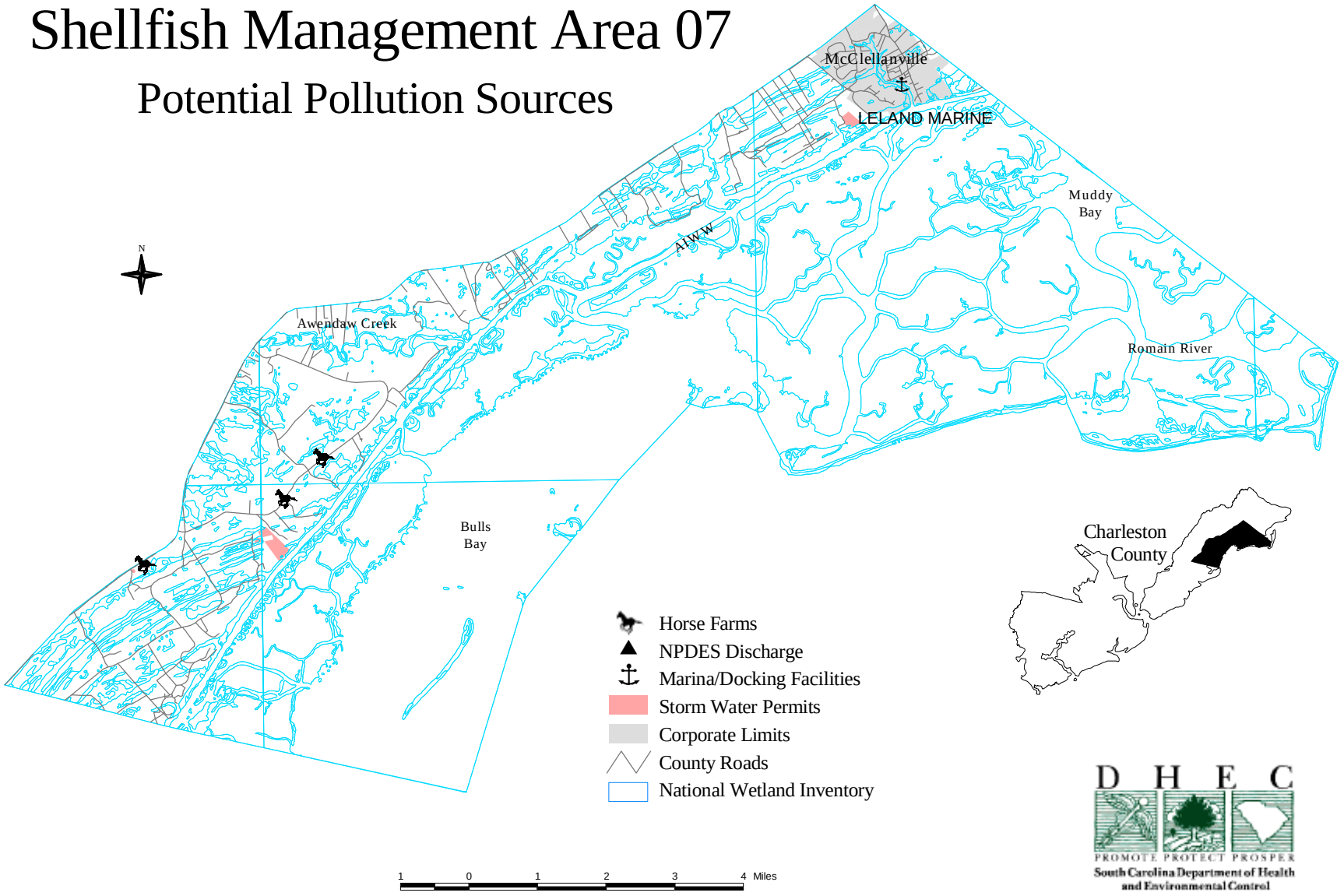

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TABLE #2
Shellfish Management Area 07

FECAL COLIFORM BACTERIOLOGICAL DATA SUMMARY
from Shellfish Water Quality Sampling Stations between

January 1, 2000 and December 31, 2002

Station #	1	1A	2	2A	3	4	4A	5	6	6A
SAMPLES	36	36	36	36	36	36	36	36	36	36
GEO MEAN	2.6	2.4	9.1	7.6	14.8	5.1	3.3	12.7	5.4	2.8
90TH % ILE	6	4	51	47	111	22	9	92	22	6
WATER QLTY	A	A	R	R	R	A	A	R	A	A
CLASSIFICATION	A	R	R	R	R	R	R	R	R	A

Station #	8	8A	9	11	12	13	14	15	16	17
SAMPLES	36	36	36	36	36	36	36	36	36	36
GEO MEAN	5.0	2.5	4.7	2.4	2.0	2.7	10.1	35.7	2.2	4.1
90TH % ILE	19	5	16	5	2	7	51	438	3	15
WATER QLTY	A	A	A	A	A	A	R	RND	A	A
CLASSIFICATION	R	A	R	A	A	A	R	R	A	A

Station #	18	19	20							
SAMPLES	36	36	12							
GEO MEAN	3.9	7.9	3.4							
90TH % ILE	13	55	9							
WATER QLTY	A	R	New							
CLASSIFICATION	R	R	New							

A - Approved **CA** - Conditionally Approved **R** - Restricted
RND - Restricted/No Depuration **P** - Prohibited

TABLE #3

Water Quality
Sampling Stations Data

Shellfish Management Area 07

BACTERIOLOGICAL DATA

Data for each shellfish station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained through South Carolina's Department of Health and Environmental Control - Freedom of Information office at the address below.

Freedom of Information
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

TABLE #4

Rainfall Data

Shellfish Management Area 07

SOURCE:
Rainfall information provided by
Wambaw Ranger District
Francis Marion National Forest, McClellanville, SC

ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Wambaw Ranger District

Francis Marion National Forrest, McClellanville, SC

2000	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.34	0.00	0.00	0.00
3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	1.52	0.00	0.00	0.14
4th	0.00	0.00	0.58	0.00	0.00	0.00	0.00	0.82	0.85	0.00	0.00	0.00
5th	0.17	0.00	0.01	0.00	0.00	0.14	0.00	0.64	5.49	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.01	0.10	0.00	0.84	0.00	0.00	0.00
7th	0.32	0.00	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00	0.00	0.00
8th	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00
9th	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10th	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	1.67
11th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00
12th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.52	0.00	0.00	0.00	0.05
13th	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00
14th	0.00	1.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
15th	0.00	0.05	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16th	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23
17th	0.00	0.00	0.32	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.12	0.15
18th	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.61	0.00	0.00	0.00
19th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.47	0.00	0.00	0.70	0.00
20th	0.20	0.00	1.55	0.00	0.00	0.11	0.00	0.00	0.00	0.00	1.08	0.09
21st	0.00	0.00	0.00	0.00	0.00	0.42	0.00	0.00	0.07	0.00	0.00	0.00
22nd	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.23	0.00	0.00	0.00
23rd	0.13	0.00	0.00	0.00	0.00	0.00	2.01	0.62	0.85	0.00	0.00	0.00
24th	0.60	0.00	0.00	0.00	0.00	0.00	0.53	0.00	0.20	0.00	0.00	0.00
25th	0.69	0.00	0.00	0.31	0.00	0.57	0.42	0.00	0.00	0.00	0.00	0.00
26th	0.00	0.00	0.00	0.00	1.34	0.08	0.03	0.00	0.00	0.00	2.12	0.00
27th	0.00	0.06	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.00	0.30	0.21	0.00	0.01	0.00	0.44	0.00	0.00	0.00	0.14
29th	0.00	0.00	0.00	0.00	0.46	0.28	2.57	1.03	0.00	0.00	0.00	0.79
30th	0.00		0.00	0.36	0.00	3.41	1.18	0.00	0.20	0.00	0.00	0.00
31st	0.80		0.00		0.00		0.22	0.00		0.00		0.00

(Monthly Figures) **Year's Rainfall Total: 62.01**

TOTAL	3.33	1.60	3.24	1.84	1.80	5.78	9.97	7.87	19.22	0.00	4.04	3.32
MAX	0.80	1.46	1.55	0.64	1.34	3.41	2.60	3.52	8.61	0.00	2.12	1.67
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.11	0.06	0.10	0.06	0.06	0.19	0.32	0.25	0.64	0.00	0.13	0.11

(Shellfish Management Areas 06A, 06B, and 07.)

ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Wambaw Ranger District

Francis Marion National Forrest, McClellanville, SC

2001	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.00	0.67	0.00	0.00	0.00
2nd	0.00	0.00	0.00	0.00	0.00	0.14	0.01	0.13	0.00	0.00	0.61	0.00
3rd	0.00	0.00	1.00	0.00	0.00	0.00	1.13	0.20	0.17	0.00	0.01	0.00
4th	0.00	0.00	0.01	0.04	0.00	0.07	0.29	0.00	0.35	0.00	0.00	0.00
5th	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.05	0.00	0.00
8th	0.31	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00
9th	0.00	0.00	0.00	0.00	0.00	0.12	0.08	0.00	0.03	0.00	0.00	0.05
10th	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.21	0.00	0.00	0.00
11th	0.00	0.00	0.00	0.00	0.17	0.78	0.00	0.00	0.23	0.00	0.00	1.86
12th	0.30	0.51	0.72	0.00	0.00	1.51	1.86	0.00	0.20	0.00	0.00	0.00
13th	0.15	0.02	0.00	0.00	0.81	0.01	0.44	0.00	0.00	0.00	0.00	0.02
14th	0.00	0.01	0.00	0.00	0.00	0.40	0.19	1.22	0.11	0.03	0.00	0.19
15th	0.05	0.00	1.93	0.06	0.00	0.01	0.00	1.21	0.00	0.87	0.00	0.00
16th	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.03	0.00
17th	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12
19th	0.00	0.00	0.00	0.00	0.00	0.32	0.04	0.18	0.00	0.00	0.01	0.00
20th	0.04	0.00	1.77	0.00	0.00	0.01	0.03	0.26	0.00	0.00	0.01	0.00
21st	0.00	0.00	0.62	0.00	0.00	0.10	0.21	0.07	0.00	0.00	0.00	0.00
22nd	0.00	1.04	0.00	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.92	0.00	0.15	0.00	0.00	0.00	0.00	0.04
24th	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.93	0.00
25th	0.00	0.00	0.27	0.44	0.00	0.91	0.00	1.02	0.43	0.00	0.26	0.00
26th	0.00	0.01	0.00	0.08	1.02	0.04	0.00	0.00	0.00	0.00	0.00	0.00
27th	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.08	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00
29th	0.00		0.60	0.00	0.58	0.00	0.28	0.00	0.00	0.00	0.00	0.00
30th	0.08		0.05	0.00	0.06	0.00	0.18	0.00	0.00	0.00	0.00	0.00
31st	0.00		0.00				0.00	0.00		0.00		0.00

(Monthly Figures) **Year's Rainfall Total: 37.54**

TOTAL	0.97	2.01	6.97	0.62	3.56	4.88	6.47	4.57	2.40	0.95	1.86	2.28
MAX	0.31	1.04	1.93	0.44	1.02	1.51	1.86	1.22	0.67	0.87	0.93	1.86
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.03	0.07	0.22	0.02	0.12	0.16	0.21	0.15	0.08	0.03	0.06	0.07

(Shellfish Management Areas 06A, 06B, and 07.)

ANNUAL TABLE OF DAILY RAINFALL DATA

SOURCE: Wambaw Ranger District

Francis Marion National Forrest, McClellanville, SC

2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.67	0.06	0.00	0.00	0.00	0.49	0.03	0.00	0.00
2nd	0.00	0.00	0.50	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00
3rd	0.31	0.00	1.20	0.00	0.59	0.00	0.00	0.45	0.20	0.00	0.00	0.00
4th	0.05	0.00	0.05	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.19	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.00	0.00	0.01	0.19
6th	0.58	0.06	0.00	0.00	0.00	0.00	0.13	0.01	0.04	0.00	1.32	0.01
7th	0.01	1.60	0.00	0.00	0.00	0.00	0.54	0.03	0.00	0.00	0.00	1.32
8th	0.00	0.09	0.00	0.00	0.00	1.04	0.00	0.00	0.00	0.39	0.00	0.00
9th	0.00	0.00	0.06	0.00	0.00	0.00	0.48	0.00	0.00	0.08	0.00	0.00
10th	0.00	0.44	0.00	1.01	0.00	0.00	0.00	0.00	0.00	0.07	0.48	1.24
11th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78	0.01	0.08
12th	0.00	0.00	0.02	0.28	0.00	0.00	2.07	0.00	0.00	0.00	1.12	0.00
13th	0.87	0.00	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.78
14th	0.00	0.00	0.00	0.15	0.28	0.00	0.31	0.00	0.02	1.64	0.00	0.07
15th	0.65	0.00	0.00	0.00	0.00	0.87	0.00	0.00	0.21	1.48	0.00	0.00
16th	0.00	0.06	0.00	0.00	0.00	0.00	1.70	0.00	1.72	0.02	0.06	0.00
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.65	0.00
18th	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.06	0.00	0.17	0.00
19th	0.00	0.00	0.00	0.00	1.41	0.09	0.00	0.00	0.00	0.00	0.00	0.65
20th	0.05	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	0.13
21st	0.00	0.20	0.47	0.00	0.00	2.60	0.00	0.05	0.00	0.00	0.00	0.00
22nd	0.04	0.00	0.00	0.00	0.00	1.61	0.00	0.00	0.00	0.22	0.00	0.00
23rd	0.00	0.05	0.00	0.00	0.00	1.26	0.93	0.00	0.00	0.00	0.00	0.00
24th	0.00	0.01	0.00	0.00	0.00	0.04	0.33	0.00	1.09	0.08	0.00	0.44
25th	0.12	0.00	0.00	0.54	0.00	0.00	0.00	0.09	0.04	0.01	0.00	0.89
26th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	2.34	0.00	0.00	0.00
27th	0.00	0.00	0.44	0.27	0.00	0.00	0.14	1.58	0.00	0.00	0.00	0.00
28th	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.00
29th	0.00		0.00	0.00	0.00	0.35	0.00	2.09	0.00	0.09	0.00	0.00
30th	0.00		0.00	0.00	0.05	0.00	0.00	2.36	0.00	0.18	0.00	0.00
31st	0.00		0.00		0.00		0.00	0.23		0.00		0.00

(Monthly Figures) **Year's Rainfall Total: 63.38**

TOTAL	2.69	2.51	3.79	2.92	2.99	9.11	6.65	9.16	7.03	6.07	4.66	5.80
MAX	0.87	1.60	1.20	1.01	1.41	2.60	2.07	2.36	2.34	1.78	1.32	1.32
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.09	0.09	0.12	0.10	0.10	0.30	0.21	0.30	0.23	0.20	0.16	0.19

(Shellfish Management Areas 06A, 06B, and 07.)

Table #5

Santee Cooper
Water Diversion Data

Shellfish Management Area 07

Shellfish Management Area 07
Average Daily Rate of Total Water Released
By Santee Cooper Into The Santee River
All Daily Averages Shown as Cubic Feet per Second (CFS)

Sample Date	24 Hours Prior	48 Hours Prior	72 Hours Prior	96 Hours Prior	120 Hours Prior
12/10/02	8,163.63	6,499.92	6,616	6,268	6,597.88
11/04/02	553.38	552	557	565.96	564.67
10/15/02	557.33	540.25	548	516	556.83
09/09/02	580.96	600	600	589.71	576.25
08/06/02	585.21	584.88	884.71	595.42	599.42
07/22/02	1,319.17	1,138.42	588.21	588.04	2,308.63
06/18/02	1,909.88	588.21	596.63	584.46	600
05/13/02	604.29	601.75	587.42	1,501.42	736.29
04/09/02	602	584.25	610.38	602.92	606.08
03/06/02	600	1,481.13	600	600	600
02/11/02	600	1,233	600	600	600
01/16/02	600	600	600	600	600
12/03/01	600	600	600	600	600
11/27/01	600	600	600	600	600
10/15/01	600	600	600	600	1,262
09/24/01	600	600	747	600	600
08/08/01	1,060	600	600	600	1,940
07/17/01	600	600	600	600	727
06/12/01	600	600	600	600	600
05/23/01	600	818	600	600	635
04/18/01	2,562	2,008	2,071	3,632	3,607
03/14/01	600	600	600	600	600
02/06/01	600	600	723	600	600
01/08/01	600	600	600	1,627	1,366
12/06/00	1,406	830	600	600	600
11/13/00	600	600	600	600	600
10/10/00	600	600	600	600	600
09/25/00	600	600	600	600	600
08/21/00	600	600	600	600	600
07/19/00	1,816	600	600	600	600
06/26/00	600	600	600	600	600
05/08/00	2,509	1,828	989	2,462	3,006
04/18/00	15,345	8,307	8,423	13,287	8,931
03/28/00	17,972	17,007	16,963	17,167	17,244
02/14/00	6,121	6,640	3,574	2,765	3,742

01/19/00	7,117	1,583	4,926	14,101	8,898

Amounts shown are per day, not cumulative. Table Derived from Data Provided by Santee Cooper